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NON-TECHNICAL SUMMARY OF THE OCTOBER 20, 1992 DRAFT OF:

"TOXICITY TESTING PLAN FOR LOW IGNITION-POTENTIAL CIGARETTES"

The following is a brief, non-technical, summary of a draft report from the U.S. Consumer Product Safety Commission (CPSC) and it's Expert Panel, in consultation with the U.S. Department of Health and Human Services. The draft report provides information about a plan for assessing the potential health impact of cigarettes with low ignition potential. This summary only includes information present in the draft report and does not attempt to evaluate that information.

Outline and General Purpose of the Draft Report

This report was prepared in response to a requirement in the Fire-Safe Cigarette Act of 1990. This Act requires the CPSC "to develop information on changes in the toxicity of smoke and resultant health effect of cigarettes with a reduced ability to start fires." Due to a statutory limitation of $50,000 to develop this information the CPSC decided to develop a plan for the toxicological work needed and convened an expert panel to assist in the development of the plan. The draft report consists of seven parts:

Section Title	*Author and Affiliation*
Health Effects Assessment Plan	Brian C. Lee, Ph.D. (Directorate for Health Sciences, US CPSC)
Chapter A -- Overview and Major Considerations in the Toxicity Testing of Low Ignition-Potential Cigarettes	Jeffrey E. Harris, MD, Ph.D. (Internal Medicine Associates, Massachusetts General Hospital)
Chapter B -- Smoking Machine Parameters for Collection of Total Particulate Matter and Gases from Low Ignition-Potential Cigarettes	Harold C. Pillsbury, Jr. (Cigarette Testing Consultant)
Chapter C -- Assessing Changes in Topography (Inhalation Profile) and Biological Effects of Tobacco Smoke in Humans	David M. Burns, MD (University of California at San Diego Medical Center)
Chapter D -- Analysis of Toxic Smoke Constituents	Dietrich Hoffmann, Ph.D. (American Health Foundation)
Chapter E -- Short-Term Tests for the Evaluation of Cigarette Smoke Toxicity	C. Gary Gairola, Ph.D. (Tobacco and Health Research Institute, University of Kentucky at Lexington)
Chapter F -- *In Vivo* Bioassays for Carcinogenicity	Dietrich Hoffmann, Ph.D. (American Health Foundation)

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Health Effects Assessment Plan

The report states that there are several adverse health effects which form the basis for considering the toxicity tests: lung and throat cancer, chronic obstructive lung disease, reproductive effects, fetal growth retardation, and addiction. Due to the lack of appropriate tests, expenses, or time constraints not all of these effects can be addressed at this time.

A sequential series of toxicity tests for low ignition potential cigarettes is proposed. The Federal Trade Commission (FTC) smoking machine method will be the initial way smoke is generated for testing. The first level of testing consists of analysis of cigarette smoke for various components which may relate to health effects associated with smoking. The second level consists of testing cigarette smoke tar in living cells. One of these tests detects changes in the genetic material of bacteria. Another test uses mouse cells grown in dishes to detect potential cancer-causing activity. The third level is to determine if people smoke low ignition potential cigarettes differently than the comparable brand or type currently on the market. If the way the cigarettes are smoked is different, then the first two levels of testing will be repeated with the smoking machines set to reflect the change in smoking behavior. The fourth level examines the response of animals to cigarette smoke or tar. One test will look for inflammation in the lungs of mice in response to cigarette smoke. A second test will look for tumor formation in the upper respiratory tract of hamsters exposed to smoke. The third test will look for the cancer producing ability of cigarette smoke tar by applying the tar to the skin of mice.

At each level of testing a cigarette with lowered ignition potential would be compared to its currently marketed counterpart. Both mainstream and sidestream smoke would be tested unless data were produced demonstrating that this was unnecessary. Cigarettes passing tests in the first level would proceed to the next level and so on. However, the report states that the definition of acceptable performance is "beyond the scope of this plan and the direction given by the Act." As noted above, levels one and two would be repeated based on the outcome of level three testing. Also, of note is that the plan assumes that new additives or increased levels of current additives will not be in the low ignition propensity cigarettes.

This plan was developed from the information contained in Chapters A-F.

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Chapter A

This chapter provides a general overview of the major points to be considered for the toxicity testing of low ignition-potential cigarettes.

During smoking both mainstream smoke (inhaled by the smoker) and sidestream smoke (mainly from the burning end of the cigarette) are generated. While mainstream

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and sidestream smoke are qualitatively similar the quantity of specific components differs between the two. Additionally, modifications to the cigarette can independently affect the composition of sidestream and mainstream smoke. It is concluded, therefore, that testing of low ignition potential cigarettes needs to address changes to both mainstream and sidestream smoke.

The major health effects attributed to smoking are briefly outlined. The following human diseases are listed as being increased by smoking: cancer at multiple sites, especially the lungs; non-cancerous lung diseases, such as chronic obstructive pulmonary disease, including emphysema; atherosclerotic cardiovascular disease; and negative effects on reproduction, such as lowered birth weight. Due the large number of diverse effects it is unlikely that each potential adverse effect can be examined in a practical series of toxicity tests.

Epidemiology is not a practical approach for addressing the issue of the health effects of changes in a cigarette to reduce ignition potential.

Because people may smoke cigarettes designed to reduce ignition potential differently (ex. longer or faster puffs) than currently available cigarettes it may be important to consider whether these changes affect smoke chemistry and therefore toxicity. For example, the new cigarette type may result in a smoker taking longer puffs which may then change the smoke chemistry and toxicity.

Testing can examine the effects on toxicity of a single design change in a cigarette or can examine the effects of a set of design changes compared to an unchanged control. Depending on the information available each approach is reasonable.

Testing protocols can follow either a screening or a tradeoff approach. In the screening approach new designs are subjected to a series of tests each with criteria for passing or failing. Designs which fail are eliminated from further testing, while those passing are subjected to additional scrutiny. In the tradeoff approach the relative changes in each test would be assessed in light of other information about the particular design.

. Changing cigarette additives can complicate toxicity testing. This is because new additives might introduce entirely new toxic endpoints which are not associated with current products.

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Chapter B

This chapter presents information about the FTC smoking method. Very briefly, the FTC method describes: how cigarettes are to be prepared for smoking, the type of smoking machine to use, the way the smoking machine should be operated, the method for collecting smoke products, and ways to measure moisture content, nicotine, carbon monoxide and tar. The author recommends the use of this method for studies of cigarette smoke chemistry and toxicity.

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The cost of analysis is estimated to be $3,000 to $4,000 per run. There is capability to make six runs per day at the Tobacco Institute Laboratory.

Chapter C

A summary of changes in human smoking behavior and the potential impact of those changes on toxicity is presented. The basis for concern in this area is that the toxicity of cigarette smoke is directly related to the composition of the smoke and that the composition of the smoke may be changed if the way the cigarettes are smoked is changed.

No estimate of the cost or duration of these studies is given.

Chapter D

This chapter suggests a variety of chemical analyses which could be done to aid in the determination of the change in toxicity of a low ignition potential product. These analyses are proposed because the toxicity of smoke is related to its chemical composition. The following table lists the proposed analyses and the health effect associated with the component or property measured.

Analysis	*Health Effect*
Total Particulate Matter (TPM)	Carcinogen
pH	Effect on nicotine toxicity
Redox Potential	Influence toxicity of whole smoke
Carbon Monoxide	Reduces ability of blood to carry oxygen
Nitrogen Oxides (NO_x)	Increase nitrosamine formation, inhibit enzyme function
Hydrogen Cyanide	Inhibits lung clearance, Lowers ability of body to use oxygen
Hydrocarbons (benzene, butadiene)	Suspected or known carcinogens
Aldehydes (ex. formaldehyde, acrolein)	Inhibits lung clearance, animal carcinogens
Volatile nitrosamines	Strong animal carcinogens
Tobacco-specific nitrosamines	Strong animal carcinogens
Nicotine	Associated with cardiovascular disease
Phenols	Enhance carcinogen action
Catechol	Major carcinogen
Polynuclear Aromatic Hydrocarbons (PNAs)	Major tumor initiators

The direct costs of these analyses are estimated to be $ 8,100. No estimate of the time required was given.

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lives. Tumor formation is the endpoint measured in this assay. Because the test is so labor intensive it is recommended only as a last step in a series of tests. It is estimated that a test comparing two cigarette types would take 24 - 26 months to complete at a direct cost of $185,000 -- $250,000.

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